

From ICE to EV

Nevada Transportation Conference
May 17, 2022

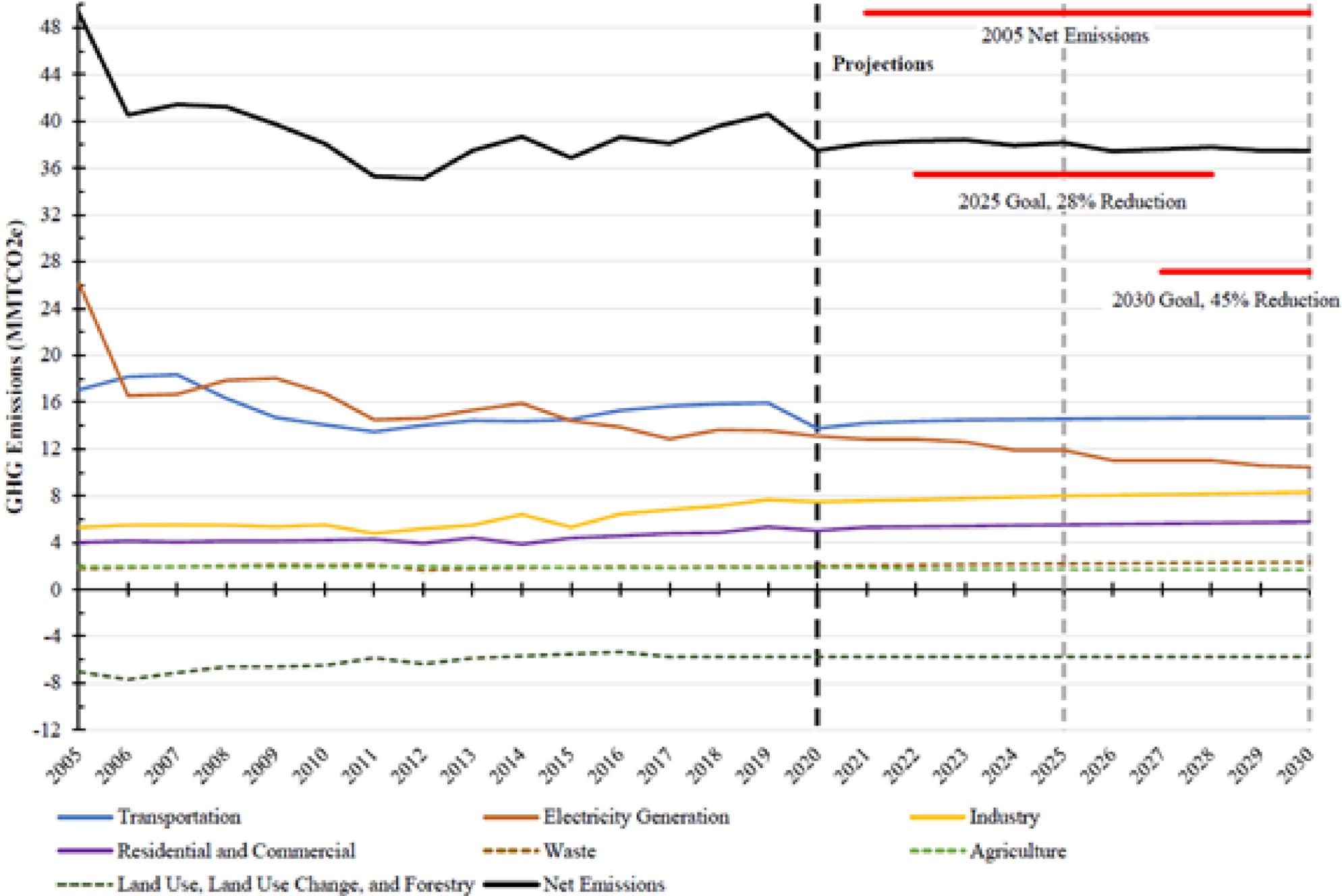
NOTICE

The information contained in this documents is confidential, privileged and only for the information of the intended recipient and may not be used, published or redistributed without the prior written consent of Tesla, Inc.



Climate Goals & Electrification of Transportation

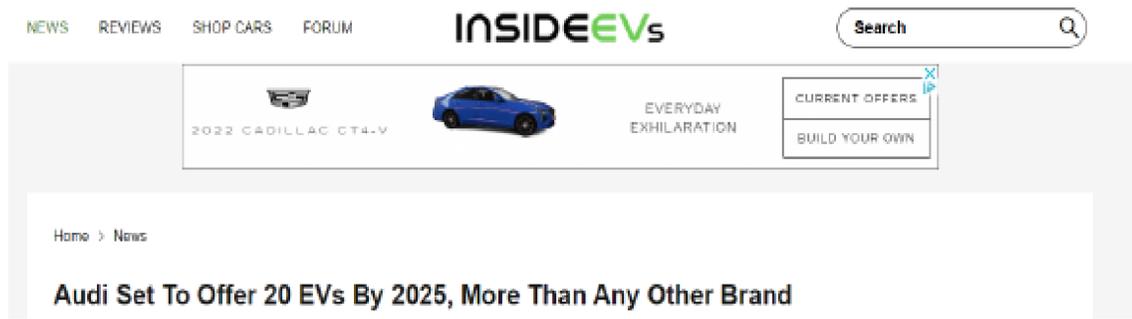
Electricity Generation Emissions Improving While Transportation Stagnates



Source: Nevada Statewide Greenhouse Gas Emissions Inventory and Projections, 1990-2041

Automaker Commitments

Over \$515B Committed Globally



GM Accelerates its Drive to Lead the EV Industry with \$7 Billion Investment in Michigan, Creating 4,000 New Jobs and Retaining 1,000

2022-01-25



FORD MEDIA CENTER

Unit

[News](#) [Multimedia](#) [Vehicles](#) [FordPro](#) [Mobility](#) [Media Kits](#) [People](#) [Contacts](#) [Lincoln](#)

Home > News > Ford To Lead America's Shift To Electric Vehicles With New Mega Campus In Tennessee And Twin B Create 11,000 Jobs And Power New Lineup Of Advanced EVs

FORD TO LEAD AMERICA'S SHIFT TO ELECTRIC VEHICLES WITH NEW MEGA CAMPUS IN TENNESSEE AND TWIN BATTERY PLANTS IN KENTUCKY; \$11.4B INVESTMENT TO CREATE 11,000 JOBS AND POWER NEW LINEUP OF ADVANCED EVS



TECH TRANSPORTATION CARS

Ford stops taking reservations for the F-150 Lightning

The electric pickup truck is just a few months from shipping

By Sean O'Kane | @sokane1 | Dec 9, 2021, 2:40pm EST

MEDIA NEWSROOM



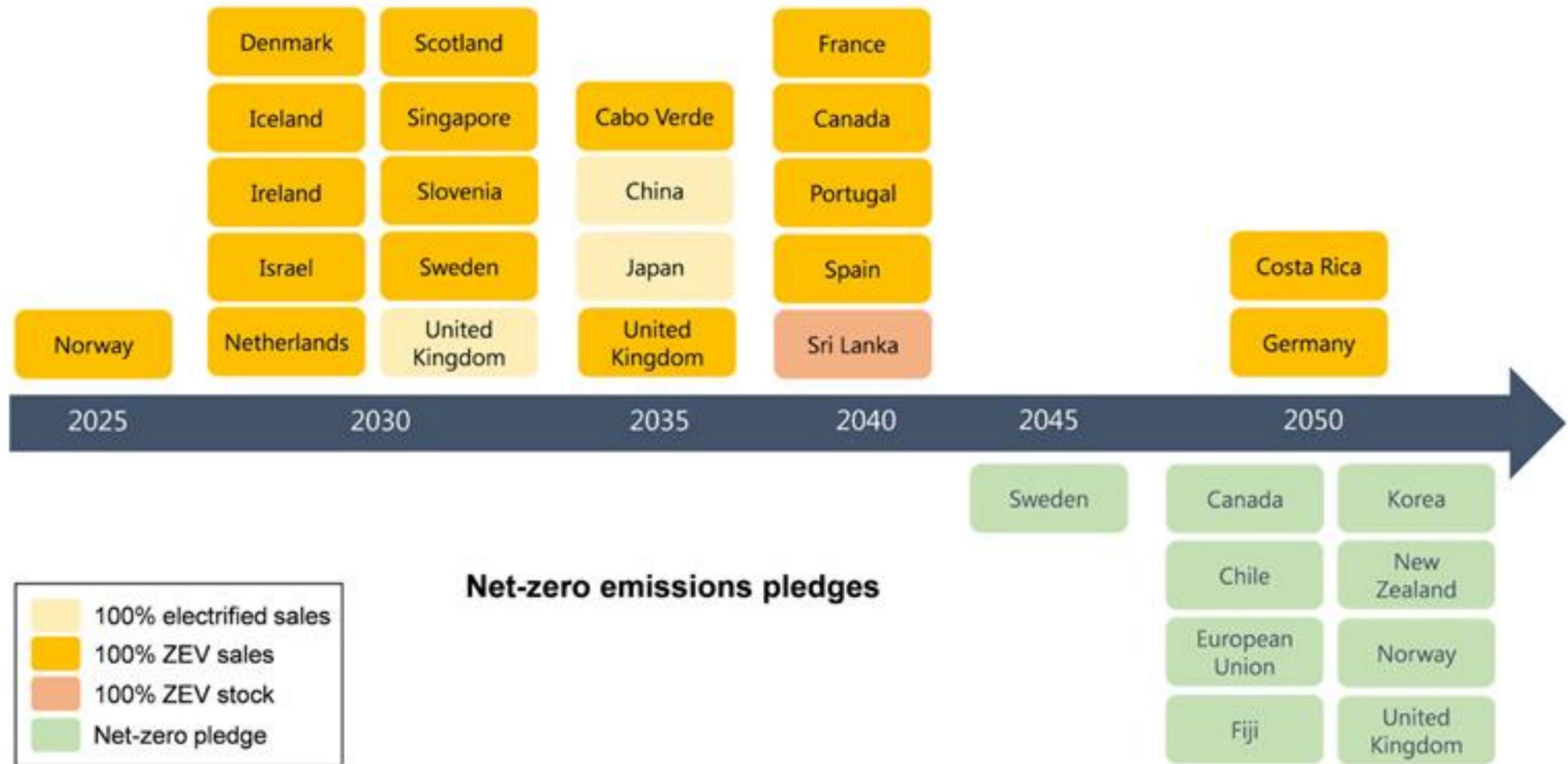
Search, social media icons, and a 'Subscribe' button.

Honda Targets 100% EV Sales in North America by 2040, Makes New Commitments to Advances in Environmental and Safety Technology

Source: NRDC

Electrification Outlook: Light Duty Vehicles

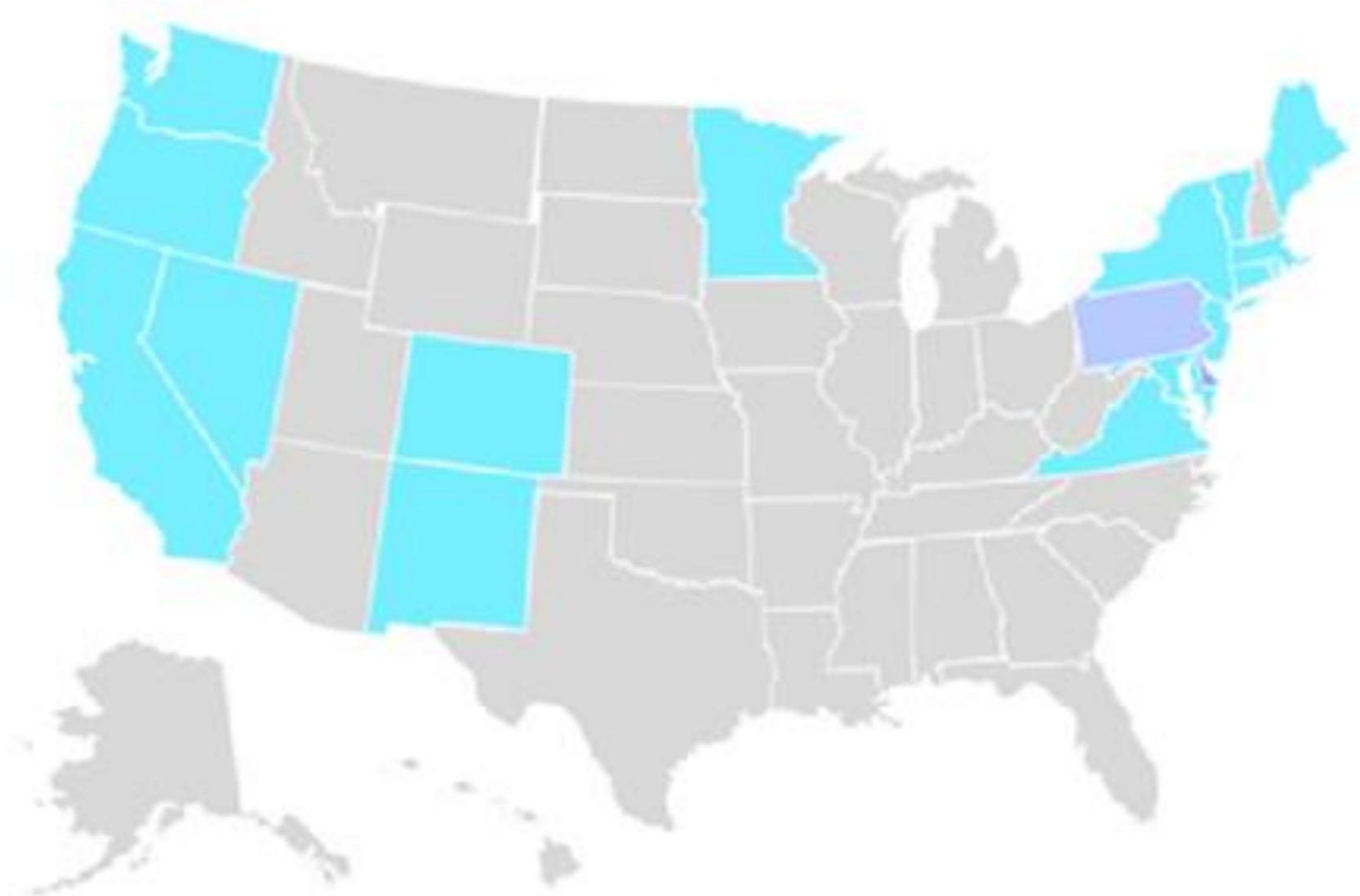
Global Electrification Targets



Source: <https://www.iea.org/reports/global-ev-outlook-2021/policies-to-promote-electric-vehicle-deployment>

Electrification Outlook: Light Duty Vehicles

Opportunity: Adoption of Advanced Clean Cars II (ACCII) in 2023

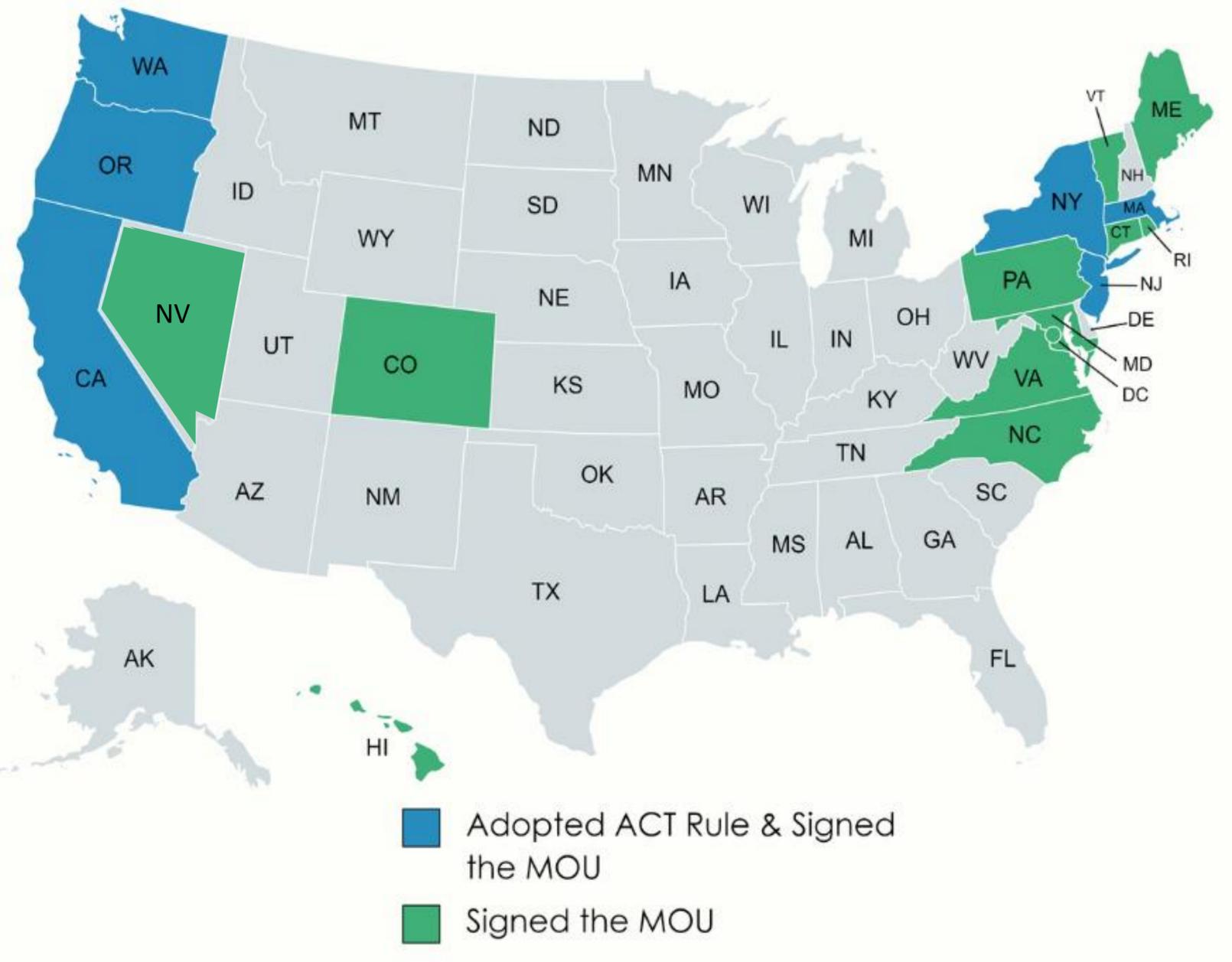


- States that have adopted LEV + ZEV Standards
- States that have adopted LEV Standard

Source: <https://cleantechnica.com/2022/05/06/new-mexico-hits-the-gas-on-cleaner-cars/>

Electrification Outlook: Advanced Clean Truck (ACT)

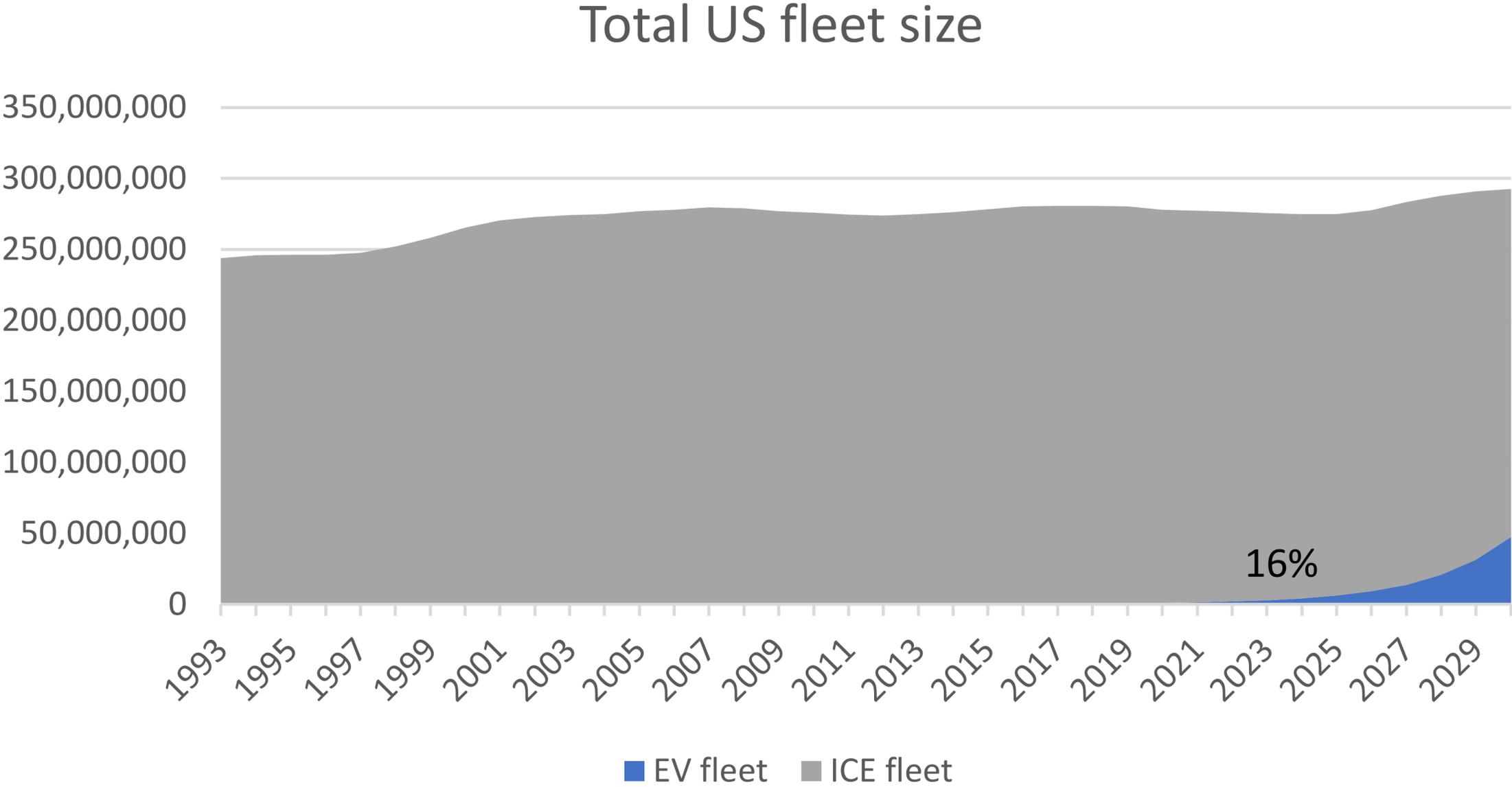
Opportunity: State Commitments to 100% ZEVs in Medium and Heavy Duty Fleets by 2050



Source: <https://www.nrdc.org/experts/patricio-portillo/epa-its-time-act-we-need-clean-trucks-now>

Total Light Duty Vehicle Fleet Size in the US

Requirement: 100% New Light Duty EV Sales

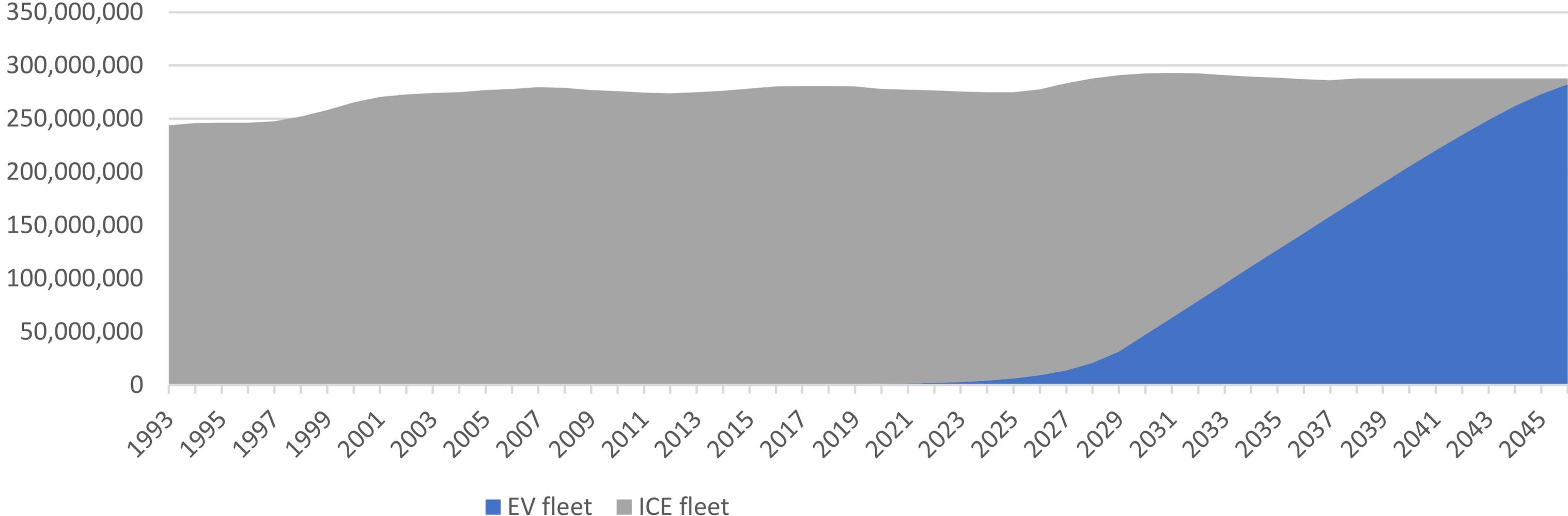


Even then, only 16% of the total fleet of ~280 million vehicles would be electric

Total vehicle Fleet Size in the US

Requirement: 100% New Light Duty EV Sales

Total US fleet size



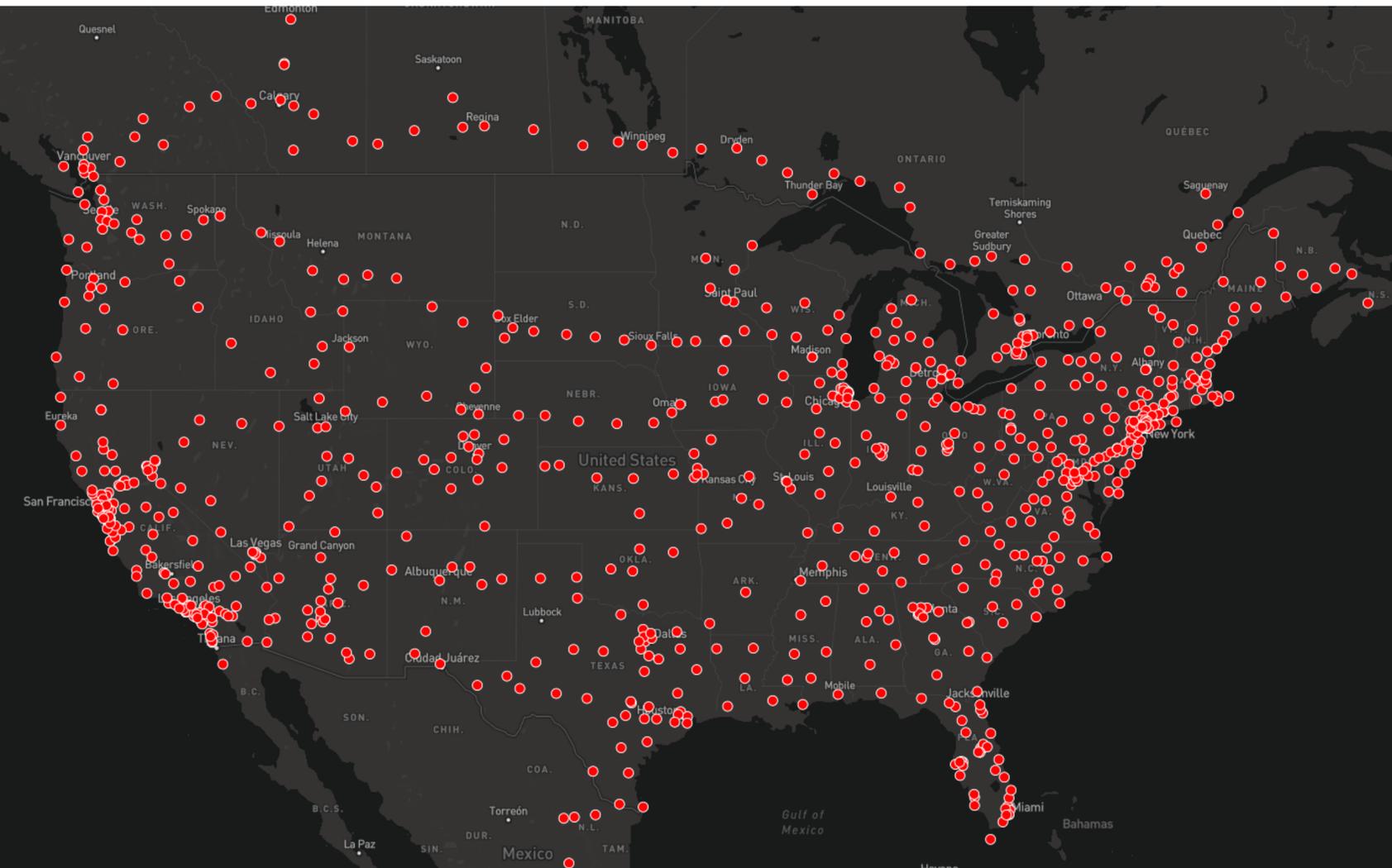
It would take another 17 years (till 2047) of 100% EV sales for the total fleet to become electric

EV Charging

Opportunity: Permit Streamlining and EV Ready Code Adoption



US Major Corridor Funding



Tesla Supercharger Network

Battery Costs as Driver towards Price Parity

Volatility in Battery Metal Prices Limits threatens Target Costs

EV projected to reach price parity with ICE by mid-2020s ...

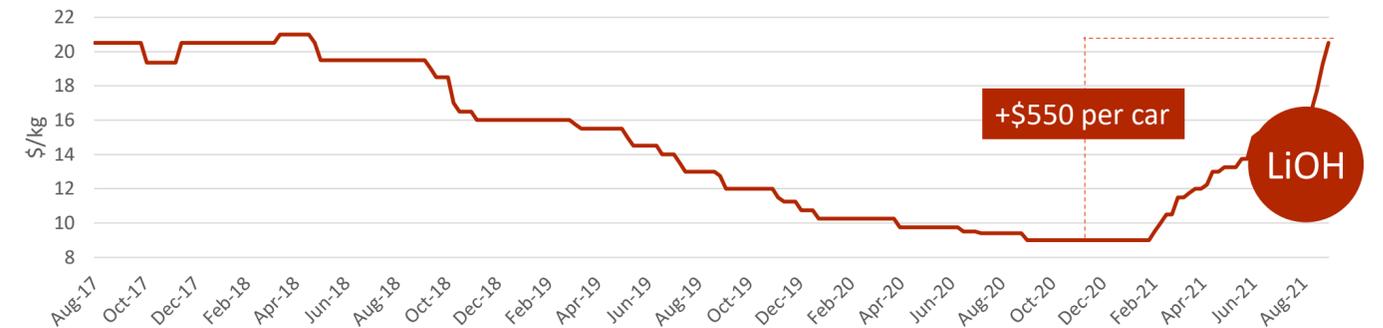
Forecast of the pre-tax price breakdown for a medium segment EV and ICE in the U.S.

real 2018 thousand dollars and %



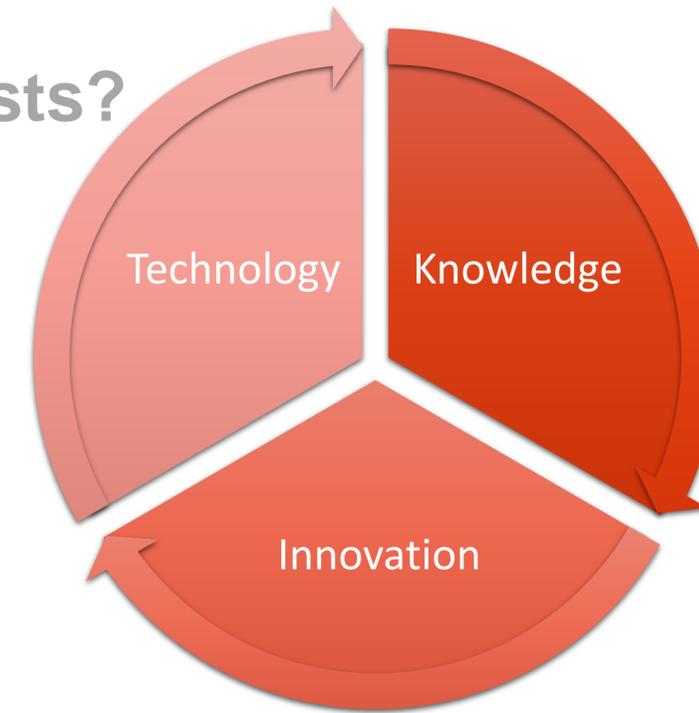
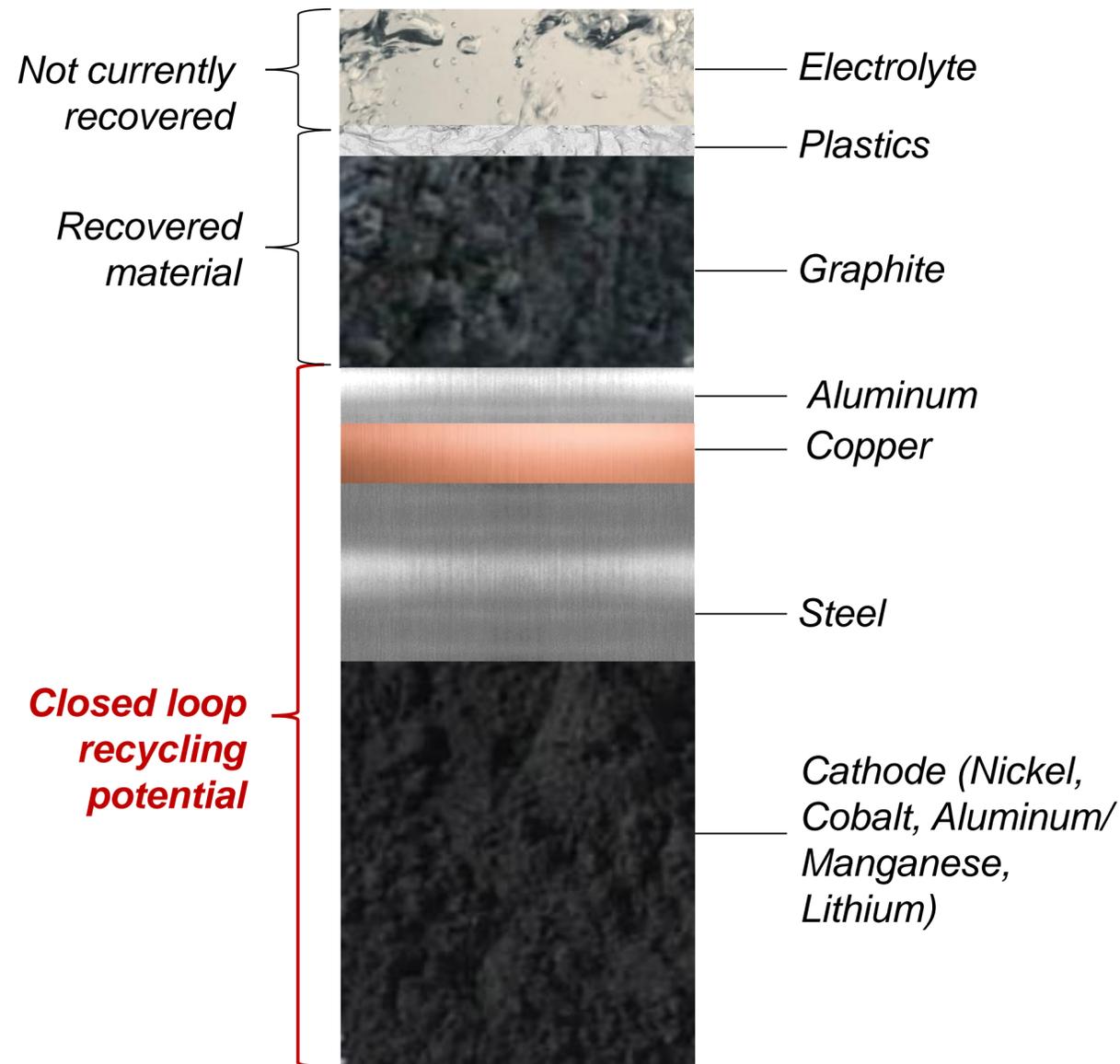
Source: BNEF

... However price volatility over last 4 years in LiOH, Ni and Co is threatening ability to further reduce costs



Battery Metals Recycling

Opportunity: Enough to Sustain Demand and Manage Costs?



- **100% of original battery materials** remain at end of life
- Metals have **infinite closed loop recycling potential**
- Recycling technology will enhance knowledge in battery materials processing further **fueling innovation**
- **Continuous iteration of R&D loop** will result in reduced costs and improved sustainability of battery life cycle thus reducing mining requirements for resources
- Combines principle of **industrial ecology** in our factory design

Battery Recycling

Economics Support Reuse or Second Life

Electric vehicles are exported to non-original markets to a higher degree than ICE vehicles



Top 5 EVs sold in Ukraine August 2021 (89% used import)

- Nissan Leaf**
207 units from EU and the US
- Tesla Model 3**
71 units from EU and NA
- Renault Zoe**
40 units from EU
- Tesla Model S**
38 units from EU
- Chevy Bolt**
37 units from NA



Imported 18650/2170 cells:

\$80-\$200/kWh



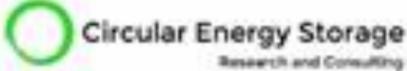
Salvaged EV modules:

\$80-\$250/kWh

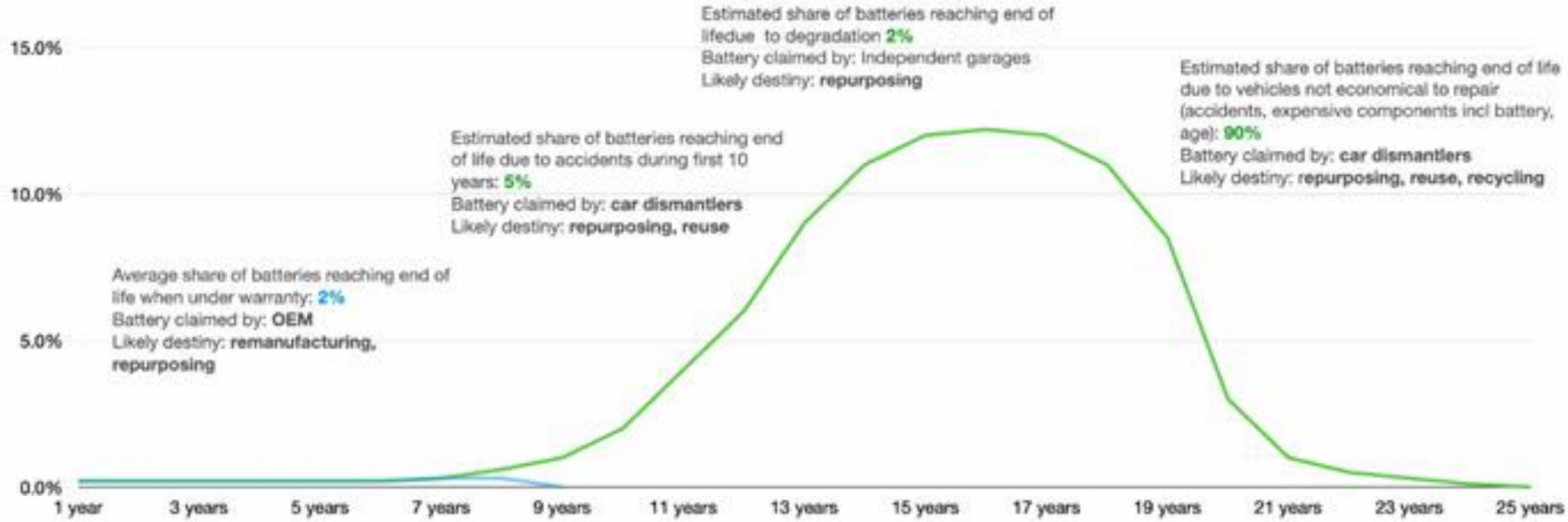
Source: Circular Energy Storage – Hans Eric Melin

Battery Recycling

Critical But Not Enough



How EV batteries reach end of life



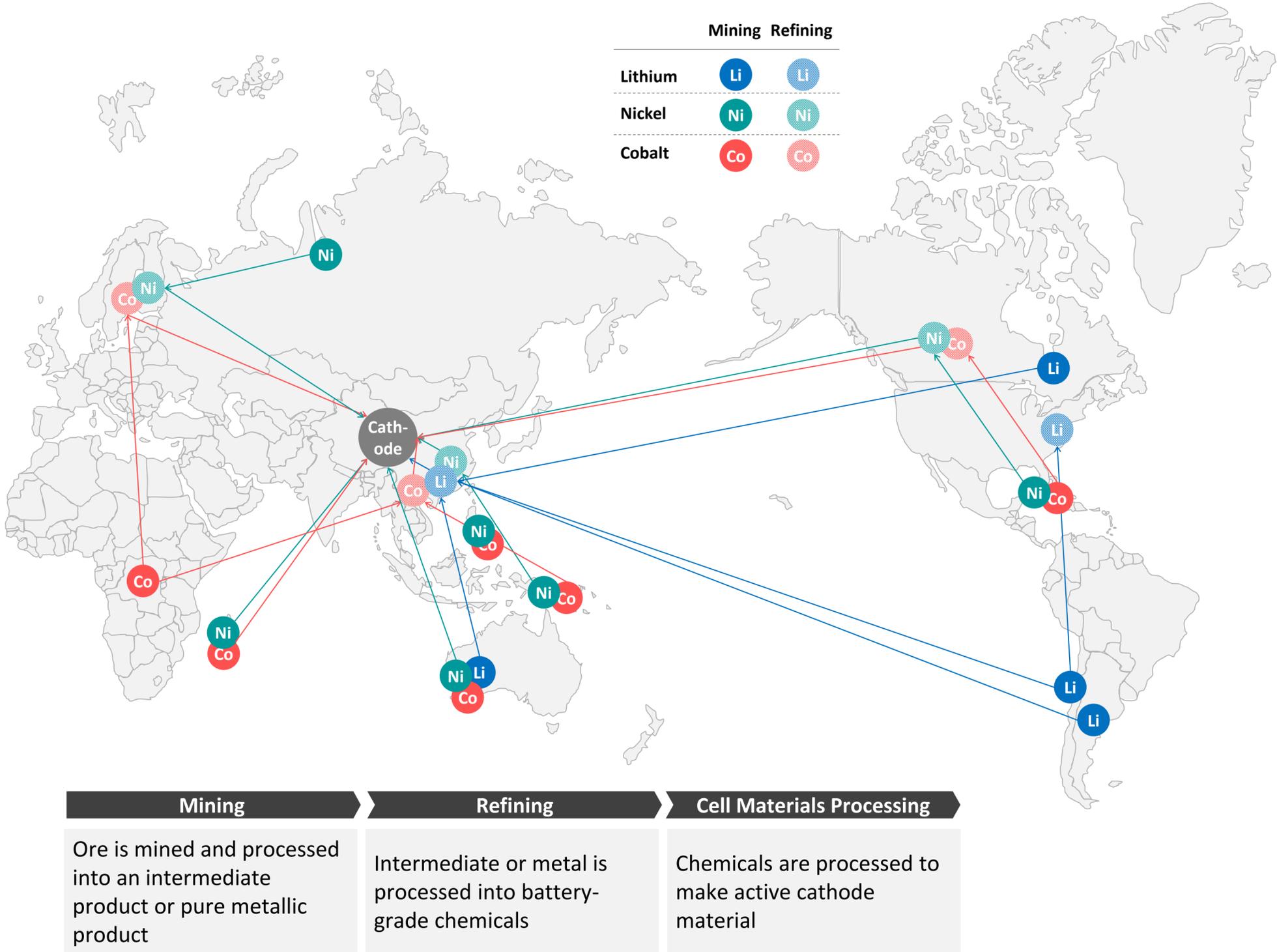
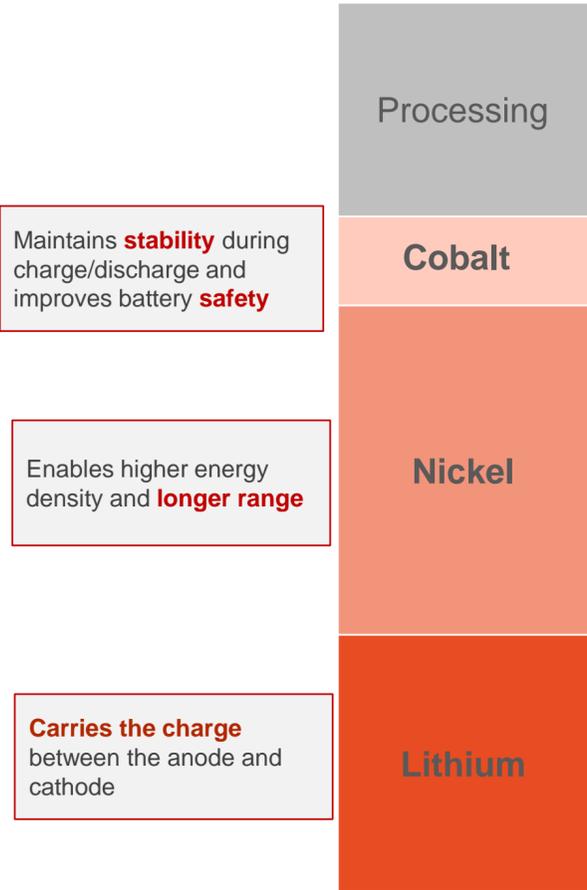
Estimates by CES based on interviews with OEMs, remanufacturers, reuse companies as well as collection and analysis of battery and vehicle data

Source: Circular Energy Storage – Hans Eric Melin

Environmentally and Social Responsible Metals Sourcing

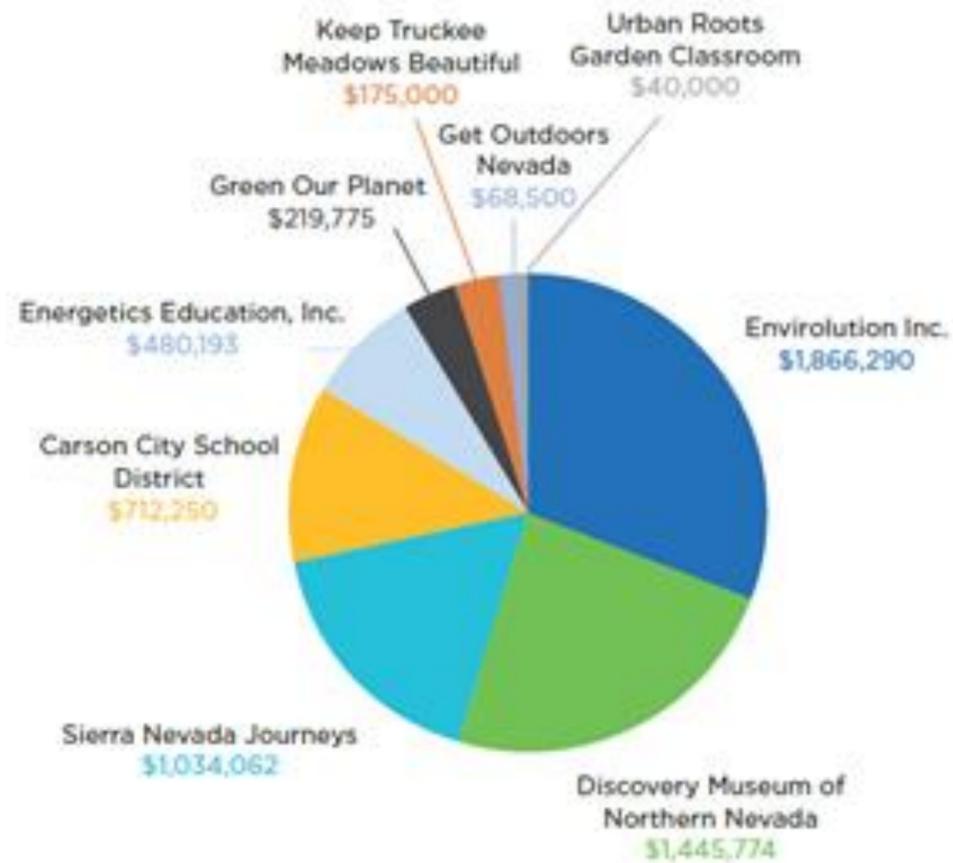
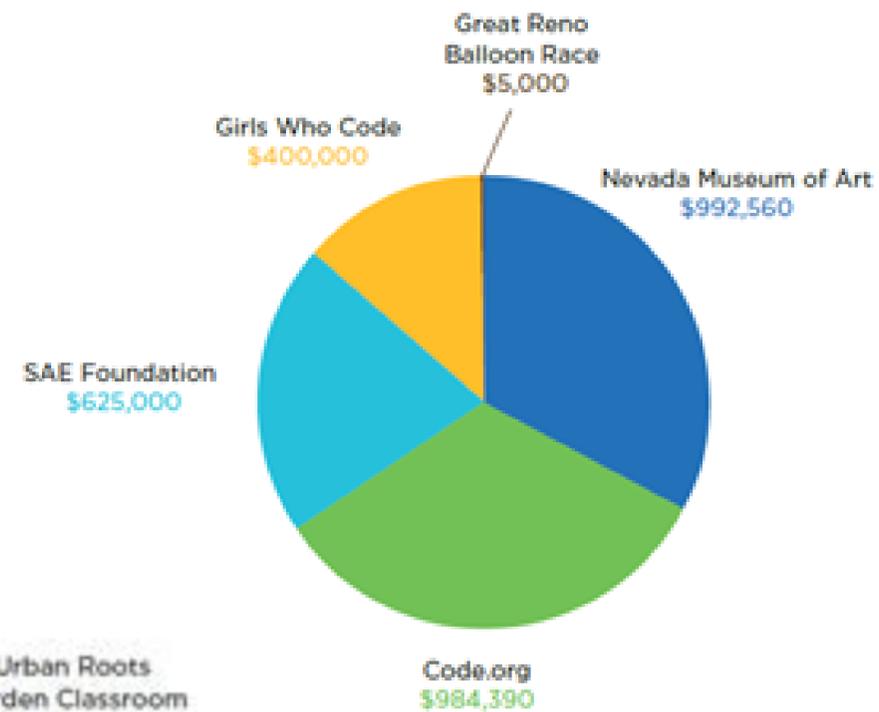
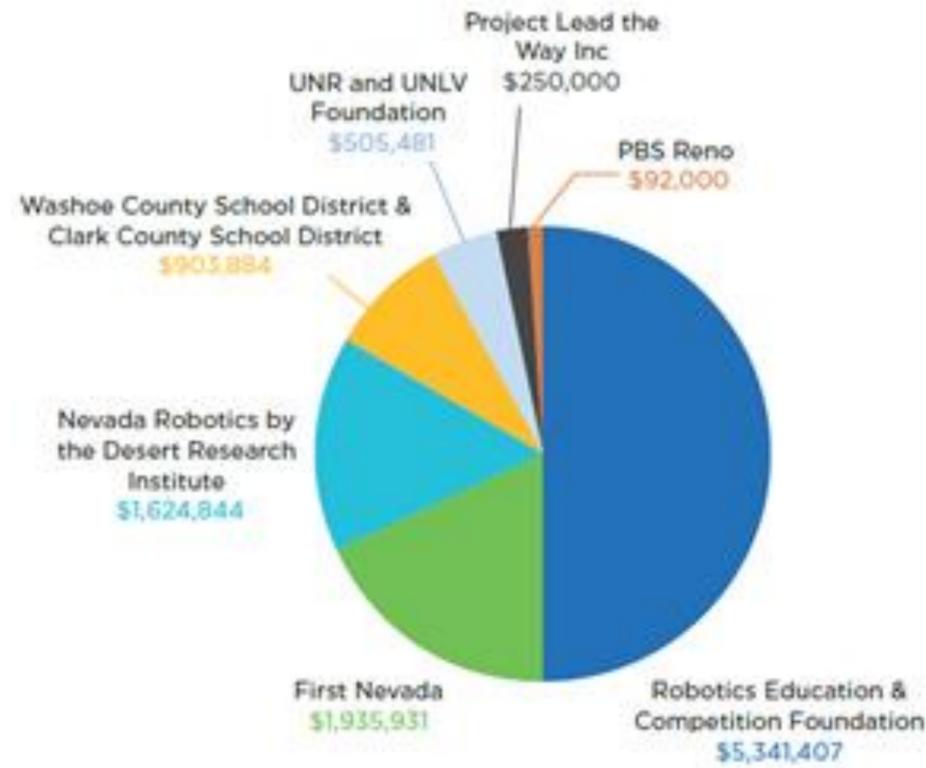
Opportunity: Metals Supply

Cathode costs driven by lithium, nickel and cobalt



Preparing Workers for the Future

Opportunity: Additional Investment



Tesla's K-12 Investment in Nevada- \$22.5M 2018-2021

<https://goed.nv.gov/wp-content/uploads/2022/04/Tesla-Nevada-K12-Investment-Update9835.pdf>

Roadway Funding

Sustainable and Fair Policy

Suggestions for a Fair Vehicle Miles Travelled (VMT) or Road Use Charge (RUC) Program:

- Must be an all-inclusive and fuel-neutral program – not just for EVs.
- Must take into account the dual policy aims of the gas tax and include the efficiency of the vehicle in determining what the per mile fee should be, with each model paying a different per mile fee based on the MPG or MPGe of the vehicle.
 - The formula would take the state gas tax divided by the US EPA's miles per gallon or miles per gallon equivalent rating of the vehicle in question to determine the per mile fee.
- Theoretically, a VMT Program is more aligned with the gas tax concept because you are paying for your usage. A flat fee forces all EV owners to contribute the same amount regardless of their actual road usage.
- Tesla supports efforts that can raise revenue while continuing to encourage efficiency.

Summary: Opportunities for Nevada Leadership

The Future is Electric

- Advanced Clean Cars II adoption
- Advanced Clean Truck Rules
- Clean Fuels Standard Adoption
- Streamline permitting processes for charging, renewable interconnection
- EV code improvements
- Sustainable and ethical metals sourcing
- Education and workforce training throughout the EV value chain
- Fair roadway funding

The Future is Electric



Lifetime fuel consumption and use-phase GHG emissions

- 30,000 litres (-8,000 U.S. Gallons) of fuel burned per car
- 70 tons of CO₂e released into the atmosphere
- Burned fossil fuel is **extremely difficult to decarbonize** as carbon capture is not economically viable today



- 70 MWh of electricity charged per car
- 30 tons of CO₂ released, assuming current global grid mix
- Production and lifetime use of EVs **is possible to decarbonize** using well-established technologies
- Battery pack is recycled at the end-of-life and used to build a brand-new battery pack, over and over again.

Source: https://www.tesla.com/ns_videos/2021-tesla-impact-report.pdf